Monday, March 4, 1991
1:30PM–5:00PM
Booth #4743
Computer-Assisted Instruction

PATIENT-CENTERED COMPUTER ASSISTED INSTRUCTION

Michael S. Gordon, M.D, Ph.D., F.A.C.C., University of Miami, Miami, FL; Gordon Ewy, M.D., F.A.C.C.; Joel Felner, M.D., F.A.C.C.; Ira Gessner, M.D., F.A.C.C.; Joan Mayer, M.D.; Donald Rosenberg, M.D., F.A.C.C.; Abdul Sajid, Ed.D.; Clarence Shub, M.D., F.A.C.C.; Robert Waugh, M.D., F.A.C.C.

Over the last 5 years, we have developed a fully featured Group IV interactive Computer-Assisted Instruction system (CAI). Cardiologists, educators and engineers from Arizona, Duke, Emory, Florida, Illinois and Mayo meet several times per year to refine our programs. Full production facilities have now been established at the University of Miami Medical Training and Simulation Laboratory.

Our system provides fully synchronized laser disc based full-motion video, removable disc based digital audio, still-frame digitized video, and high resolution computer graphics. Grading and student performance statistics are provided. A lesson can be loaded and started in a few seconds.

Each lesson initially covered bedside diagnosis with video segments of all findings (arterial and venous pulses, precordial movements, auscultation) using "Harvey", the Cardiology Patient Simulator (CPS). We have now added histories, ECG's, X rays, echo Dopplers, scintigraphy, angiograms and medical and surgical therapy for 5 of a planned series of 26 lessons. (Normal, aortic regurgitation, aortic stenosis, mitral regurgitation, mitral stenosis).

The first 2 lessons including the laboratory data and therapy sections, have undergone pilot studies involving 205 senior students at 2 institutions. An average lesson lasted 75 minutes and 90% rated the programs excellent. All students felt the laboratory studies and therapeutic options should be included in future programs, and that the CAI system was superior to slide presentations of the same material. A formal, independently evaluated national multicenter study of the first 5 programs is now underway at 6 institutions in a format that is linked to the CPS and one that stands alone.

MULTIMEDIA KNOWLEDGE MANAGEMENT APPLICATIONS FOR CARDIOVASCULAR EDUCATION

Robert C. McClure, M.D., Mark S. Dichter, M.D., John T. Fallon, M.D., Ph.D., Robert A. Greenes, M.D., Ph.D., and Bryan P. Bergeron, M.D., Decision Systems Group, Harvard Medical School, Boston, MA.

The practice of medicine demands access to multiple forms of data and knowledge. Useful information can include sounds, static images, animation sequences, or real-time video, as well as the more traditional text, structured databases, lists, tables, and graphically formatted data. Medical education should draw upon and make use of this diversity of information. The Decision Systems Group has been working with the Health Sciences and Technology (HST) Division of Harvard Medical School and the Massachusetts Institute of Technology to provide medical students with a multimedia learning environment for use in the first-year cardiovascular pathophysiology course. Objectives of this collaboration include the following: courseware that adapts to the student's comprehension of the material; complex multimedia simulations of patient cases for use in clinical problem-solving; evaluation of methodologies for redirecting or "repurposing" content developed for one application into another; and exploration of general knowledge management architectures.

Applications under development in our laboratory include the HST Arrhythmia Tutor, which adjusts the tutorial pathway by monitoring the student's learning of central concepts. Questions concerning graphics, digitized images, and EKG tracings are presented. If the student answers incorrectly an appropriate review based on the student's performance is provided. CaseBase is a multimedia authoring environment for linking content into an interactive simulation. Students are encouraged to explore the diverse content available concerning the patient including pertinent history, physical examination data, and procedure results (e.g., sequences of angiographic and echocardiologic images) and to access related information such as lists of differential diagnoses, disease profiles, textbook discussions, definitions, references, and physiologic simulations. Content used in CaseBase (as well as elsewhere) is managed in MEDBase, a multimedia database of medical content elements. Authors retrieve content from the database by identifying content attributes of interest.

Multimedia knowledge management is a crucial component of clinical information management. The approach we are taking and the tools being developed have broad application beyond the educational arena.

ENTROPY: A CARDIAC ARRHYTHMIA MULTIMEDIA DATABASE

Jeffrey N. Berman, Richard I. Fogel, Philip J. Podrid, Gary R. Garber, Boston University School of Medicine.

The media of learning in cardiology have changed little except in quantity in recent years. Despite predictions, computers have made minor impact in the management of this media. In ENTROPY, using new technology, we combine the multiple media of cardiology into an integrated database. The database is constructed of: 1) text; 2) annotated references; 3) illustrations, 4) medical images, 5) animations; 6) clinical cases; and 7) HeartBeat, a simulation of cardiac arrhythmias using a mathematical matrix model of the heart. These data elements are assembled into Supercard (Silicon Beach) projects on a Macintosh II computer and extensively interconnected.

The database is similar to a textbook with several advantages. Extensive linking allows the user to obtain information in a non-linear fashion. This makes the database of value to users of varying degrees of sophistication. Animations and clinical images with motion such as 2D echo and cineangiograms markedly enhance information content. With certain sections, the user can experiment and obtain feedback. The HeartBeat simulation allows the user to change electrophysiologic properties and study the effects of drugs. In the ECG system, the user can measure intervals and interpret the ECG. In the cases, the user can order and interpret tests and select therapy. The database can be customized by the addition of linked notecards as well as new references. References can be searched by any combination of author, title and keywords. Because the database is constructed of discrete data elements, it can be updated easily in a modular fashion. The utility of ENTROPY in clinical and classroom settings is being investigated.

INTERACTIVE ECG TEACHING SYSTEM ON THE MACINTOSH COMPUTER.

G. Garber M.D. F.A.C.C., R. Fogel M.D., J. Berman M.D., P. Podrid M.D. F.A.C.C. Boston University School of Medicine.

Learning how to interpret ECG's has been problematic. Many popular programmed texts have been published on the topic. In general these are static tools which provide little feedback. We have developed a computer based ECG interpretation teaching system that allows extensive interaction and feedback to the student.

The system is written in SuperCard (Silicon Beach) on the Macintosh II. Actual ECG's are scanned into the computer and displayed on an interpretation window. Through the use of various "Tools" the user can measure intervals with an electronic caliper, compute axis and have the system display relevant intervals. The user can then select appropriate interpretations from a list standardized from the national cardiology board examination.

The interpretation can then be automatically compared with the correct one. Erroneous answers are displayed separately. Each answer has extensive background text that can be displayed, further enhancing the educational value of the system. In addition to standard explanations,
each ECG has a unique commentary, presenting specific interesting features of that tracing.

This system represents an ideal tool for teaching ECG interpretation. It is currently being tested at our instutition for medical student training.